



SMM5846X

Ka-Band Power Amplifier MMIC

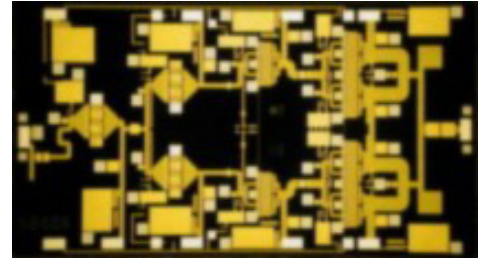
FEATURES

- High Output Power: Pout=31.5dBm (typ.)
- Linear Gain: GL=20.0dB (typ.)
- Frequency Band: 27.5 to 29.5GHz
- Impedance Matched Zin/Zout=50ohm

DESCRIPTION

The SMM5846X is a MMIC amplifier that contains a four-stages amplifier, internally matched, for standard communications band in the 27.5 to 29.5GHz frequency range. This product is well suited for Ka-band point to point radio communication.

SUMITOMO ELECTRIC 's stringent Quality Assurance Program assures the highest reliability and consistent performance.



ABSOLUTE MAXIMUM RATING

Item	Symbol	Rating	Unit
DC Positive Supply Voltage	V _{DD}	10	V
DC Negative Supply Voltage	V _{GG}	-3	V
Input Power	P _{in}	+22	dBm
Storage Temperature	T _{stg}	-55 to +125	deg.C

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Recommend	Unit
DC Positive Supply Voltage	V _{DD}	up to 6	V
Input Power	P _{in}	up to +16	dBm
Operating Case Temperature	T _C	-40 to +85	deg.C

This Product should be hermetically packaged.

ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta=25deg.C)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
RF Frequency Range	f	V _{DD} =+6V	27.5	-	29.5	GHz
Output Power at 13dBm Input	P _{OUT}	I _{DD} =1100mA typ.	29.5	31.5	-	dBm
Output Power at 1dB G.C.P.	P _{1dB}	V _{GG} -constant	-	31	-	dBm
Power Gain at 1dB G.C.P.	G _{1dB}	Z _S =Z _L =50ohm	16	19	-	dB
Power-added Efficiency at 1dB G.C.P.	N _{add}		-	15	-	%
Third Order Intermodulation*	IM ₃	*:Δf=10MHz ,	38	42	-	dBc
Output Third Order Intercept Point*	OIP ₃	2-Tone Test,	-	39	-	dBm
Drain Current at 1dB G.C.P.	I _{DDRF}	P _{out} =18dBm S.C.L.	-	1450	1850	mA
Input Return Loss (at Pin=-20dBm)	RL _{IN}		-	-10	-	dB
Output Return Loss (at Pin=-20dBm)	RL _{OUT}		-	-10	-	dB

Note : RF parameter sample size 10ps. Criteria (accept/reject)=(0/1)

G.C.P.:Gain Compression Point
S.C.L.:Single Carrier Level

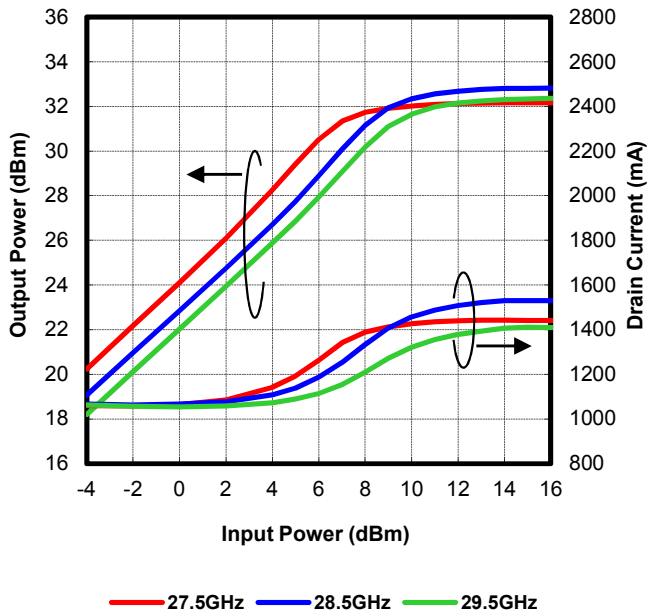
ESD	Class 0	up to 250V
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Note: Based on JEDEC JESD22-A114-C (C=100pF, R=1.5kohm)

CASE STYLE	DIE
RoHS Compliance	Yes

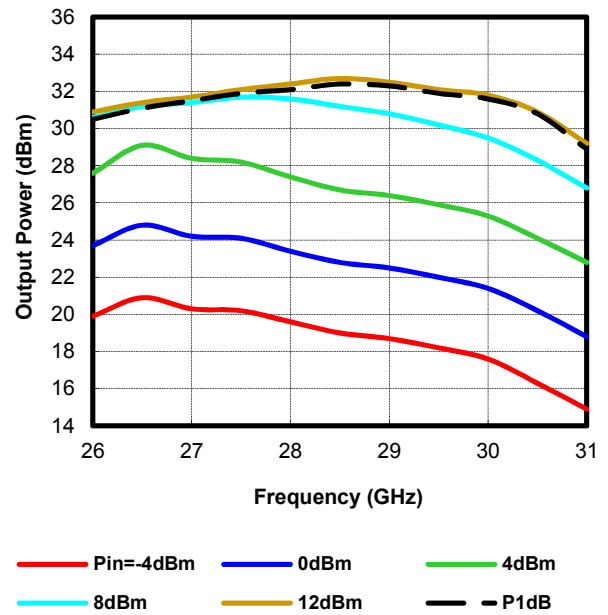
Output Power, Drain Current vs. Input Power

@VDD=6V, IDD(DC)=1100mA



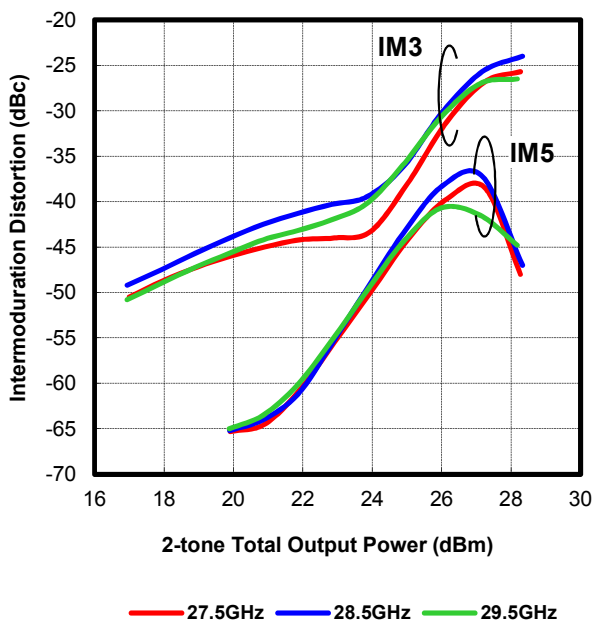
Output Power vs. Frequency

@VDD=6V, IDD(DC)=1100mA



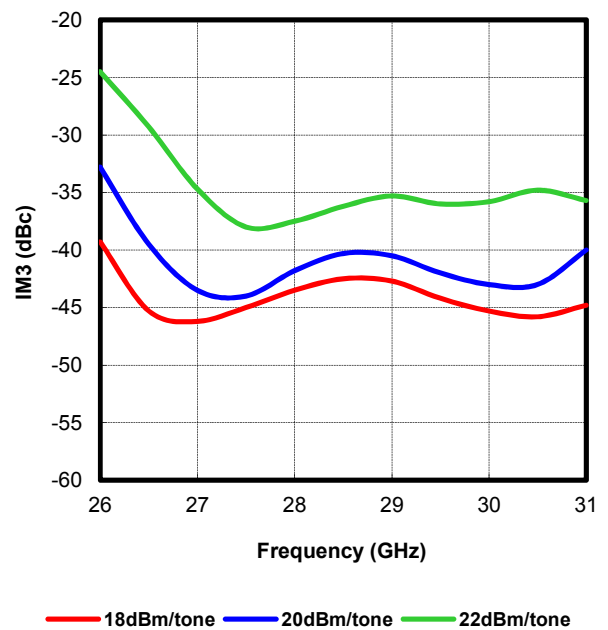
IMD Performance vs. Output Power

@VDD=6V, IDD(DC)=1100mA



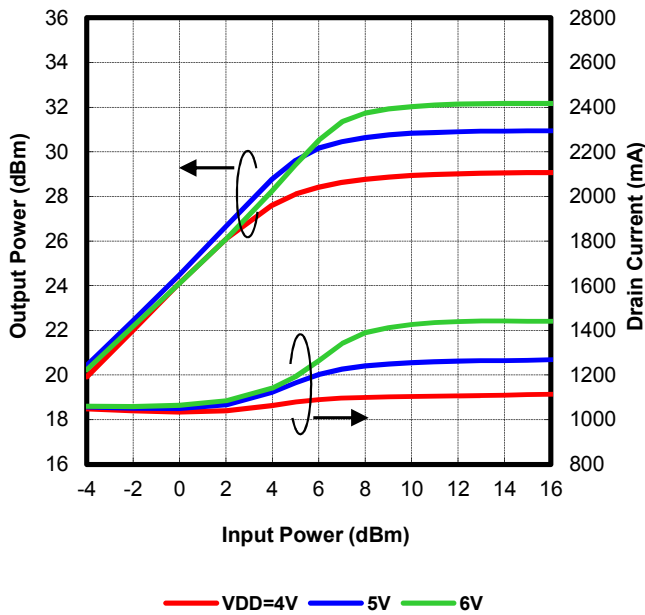
IM3 Performance vs. Frequency

@VDD=6V, IDD(DC)=1100mA



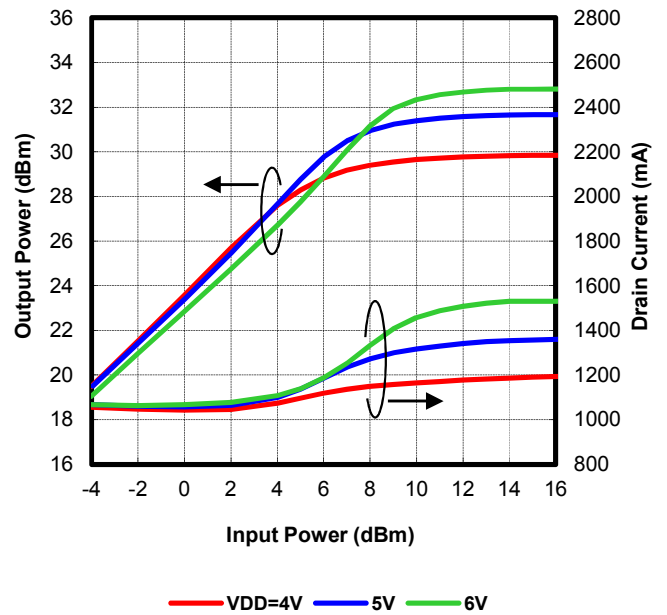
Output Power, Drain Current vs. Input Power by Drain Voltage

@IDD(DC)=1100mA, Freq=27.5GHz



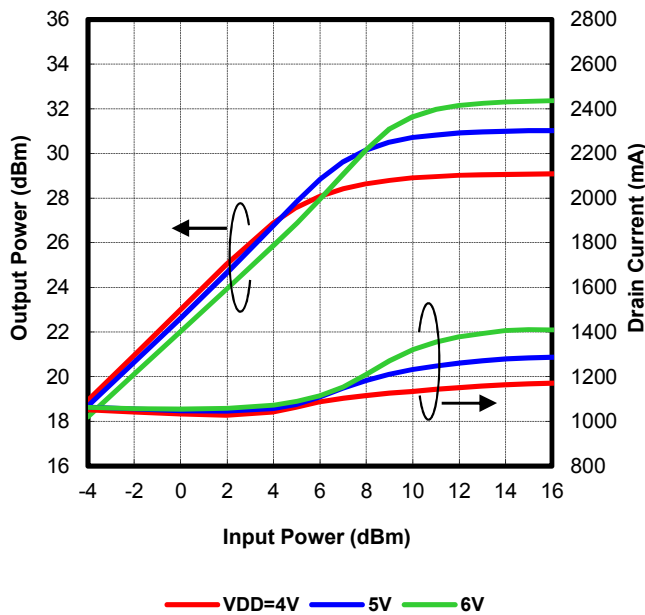
Output Power, Drain Current vs. Input Power by Drain Voltage

@IDD(DC)=1100mA, Freq=28.5GHz



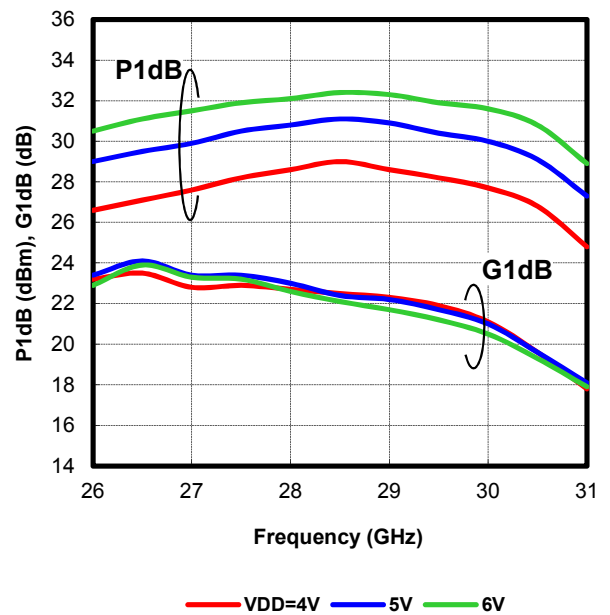
Output Power, Drain Current vs. Input Power by Drain Voltage

@IDD(DC)=1100mA, Freq=29.5GHz



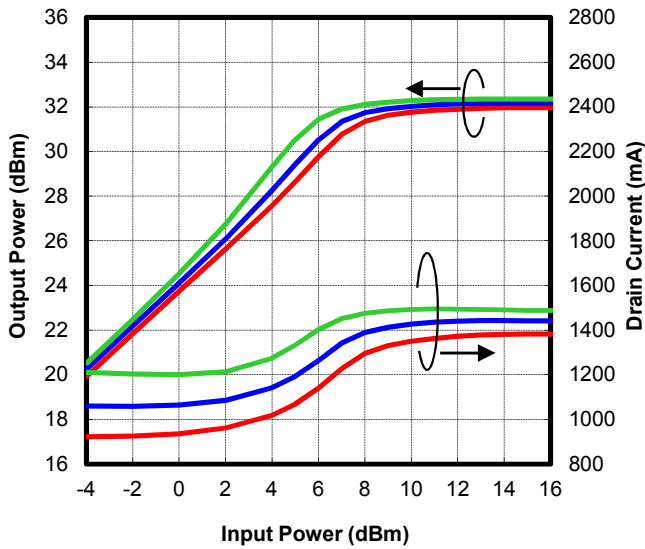
P1dB, G1dB vs. Frequency by Drain Voltage

@IDD(DC)=1100mA



Output Power, Drain Current vs. Input Power by Drain Current

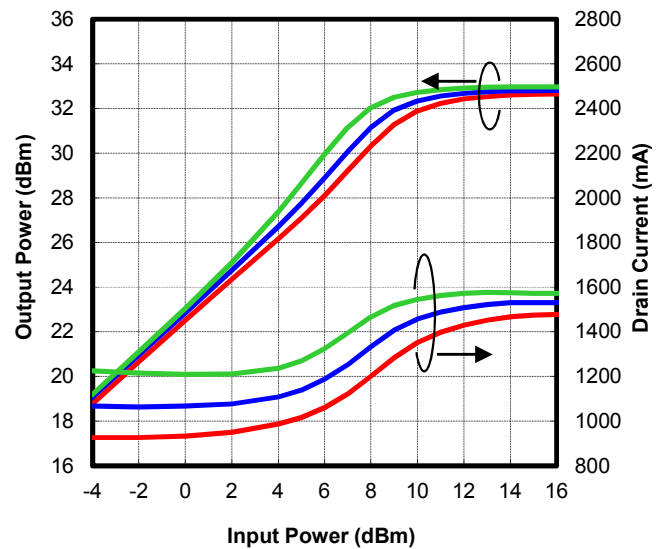
@IDD(DC)=1100mA, Freq=27.5GHz



— IDD(DC)=950mA — 1100mA — 1250mA

Output Power, Drain Current vs. Input Power by Drain Current

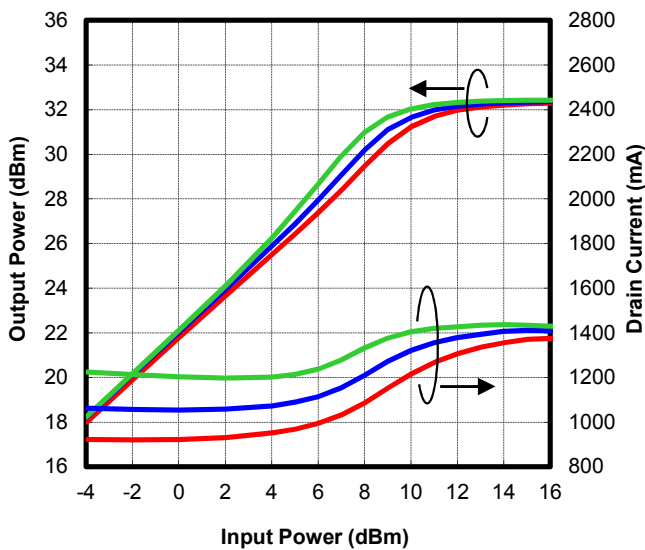
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Output Power, Drain Current vs. Input Power by Drain Current

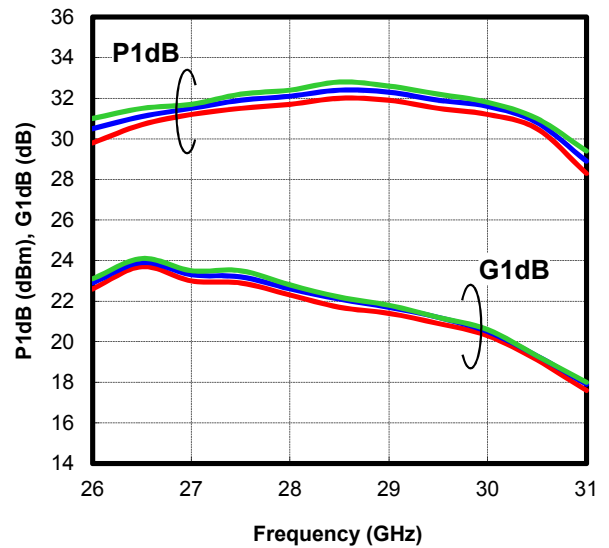
@IDD(DC)=1100mA, Freq=29.5GHz



— IDD(DC)=950mA — 1100mA — 1250mA

P1dB, G1dB vs. Frequency by Drain Current

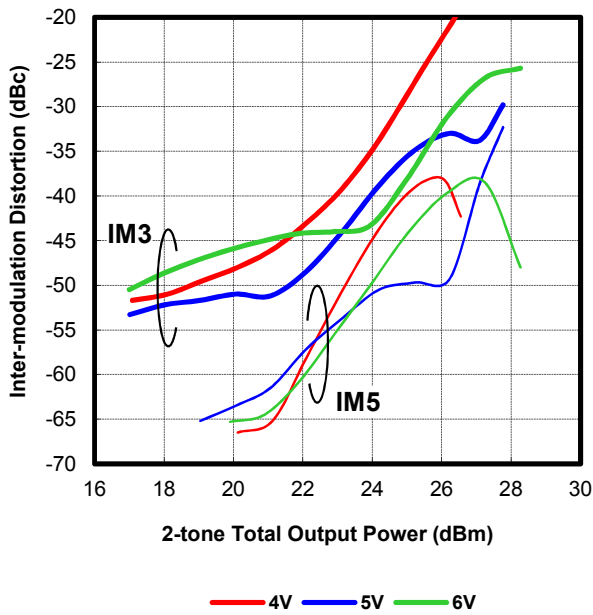
@VDD=6V



— IDD(DC)=950mA — 1100mA — 1250mA

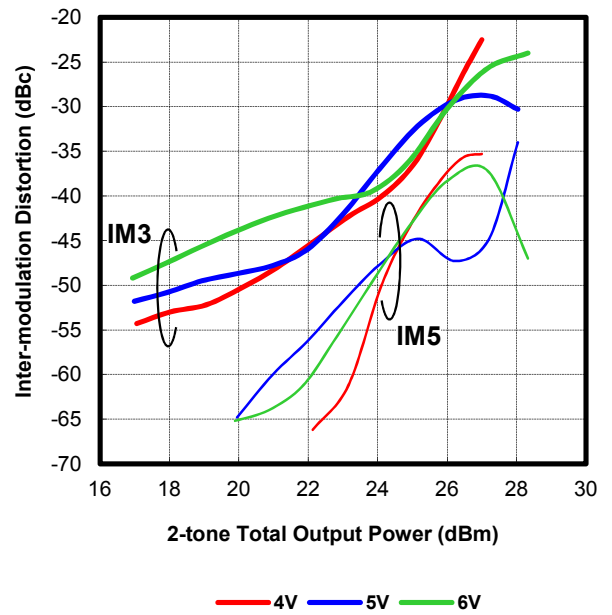
Inter-modulation Distortion vs. Output Power by Drain Voltage

@IDD(DC)=1100mA, Freq=27.5GHz



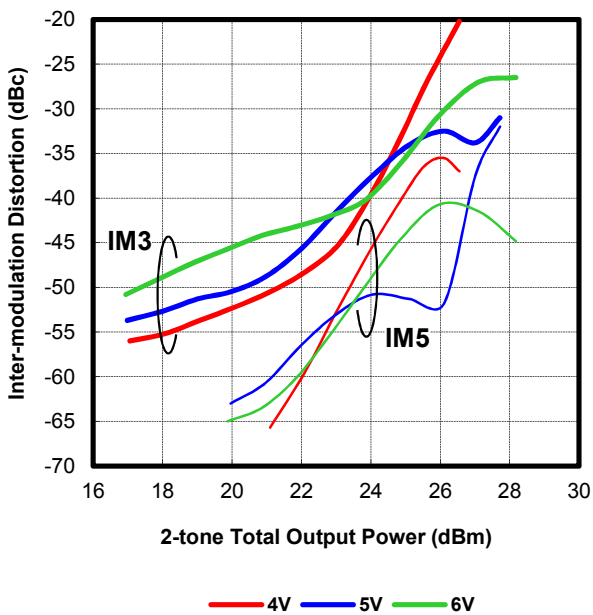
Inter-modulation Distortion vs. Output Power by Drain Voltage

@IDD(DC)=1100mA, Freq=28.5GHz



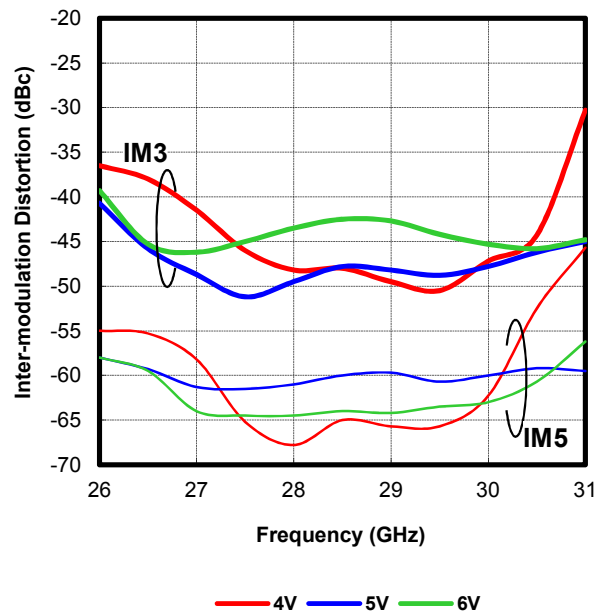
Inter-modulation Distortion vs. Output Power by Drain Voltage

@IDD(DC)=1100mA, Freq=29.5GHz



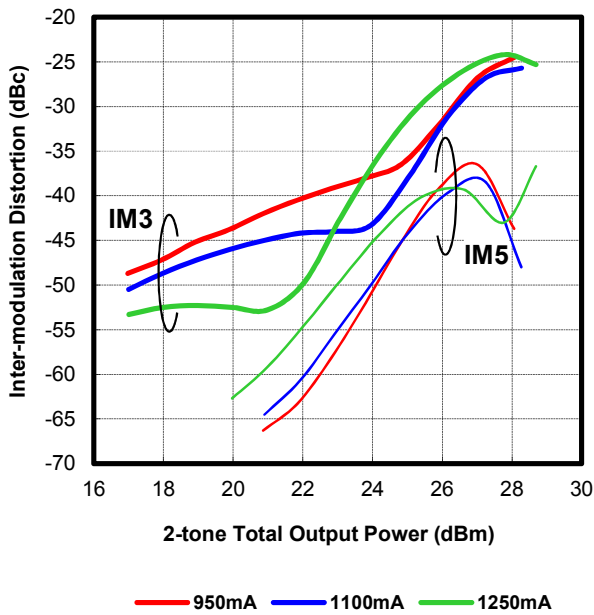
Inter-modulation Distortion vs. Frequency by Drain Voltage

@IDD(DC)=1100mA, Pout=18dBm/tone



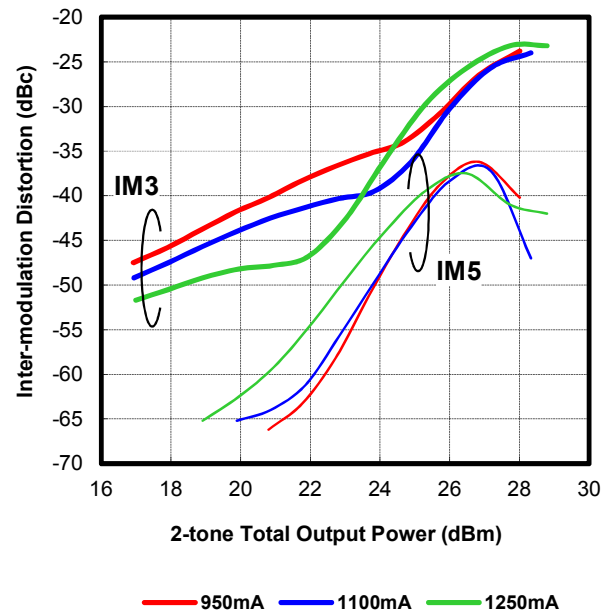
Inter-modulation Distortion vs. Output Power by Drain Current

@IDD(DC)=1100mA, Freq=27.5GHz



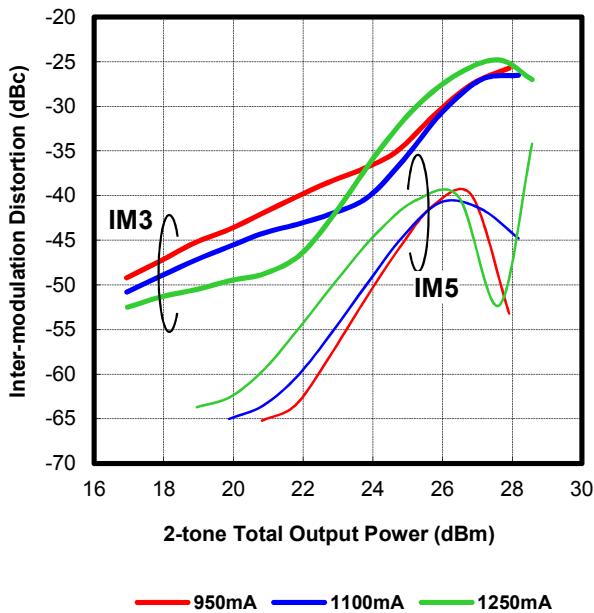
Inter-modulation Distortion vs. Output Power by Drain Current

@IDD(DC)=1100mA, Freq=28.5GHz



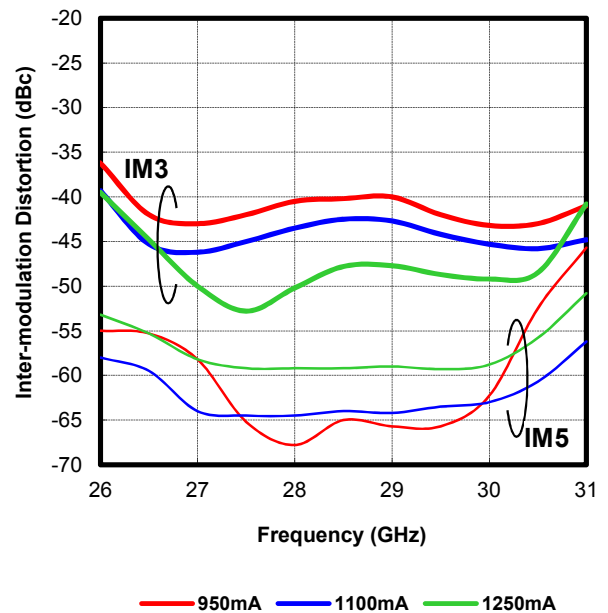
Inter-modulation Distortion vs. Output Power by Drain Current

@IDD(DC)=1100mA, Freq=29.5GHz



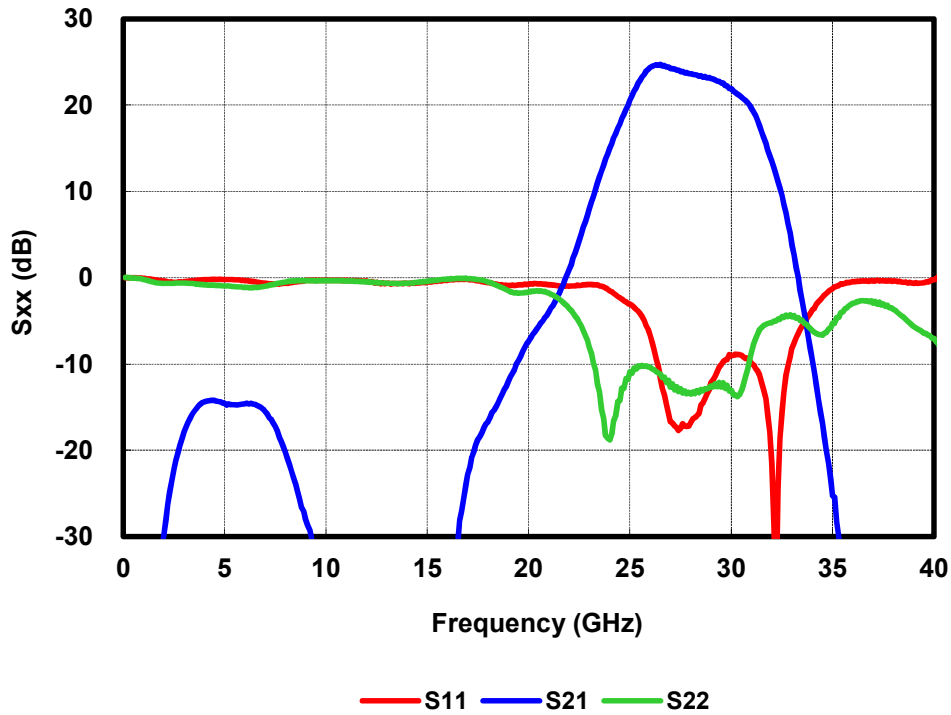
Inter-modulation Distortion vs. Frequency by Drain Current

@VDD=6V, Pout=18dBm/tone

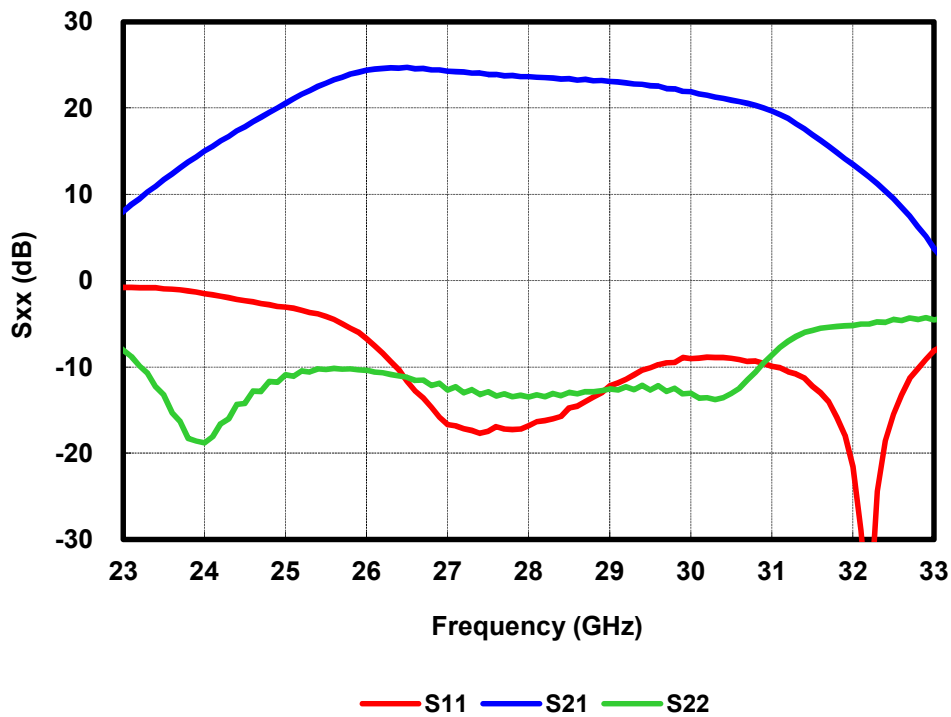


■ S-PARAMETERS

@VDD=6V, IDD=1100mA

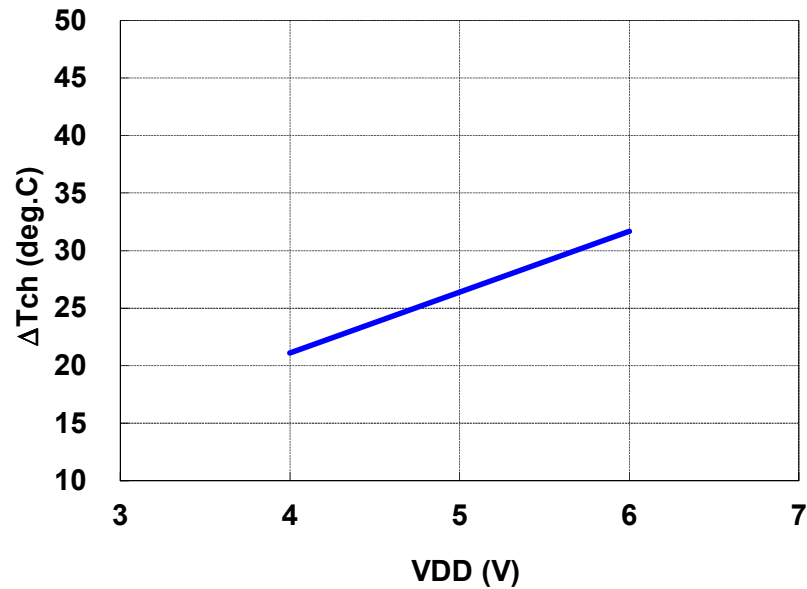


@VDD=6V, IDD=1100mA

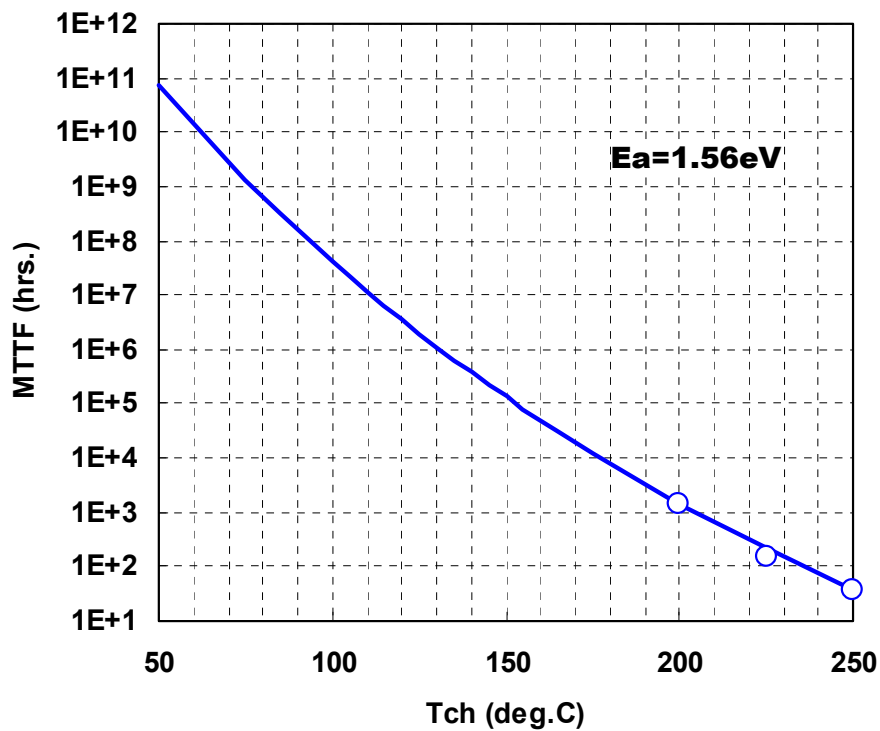


**ΔT_{ch} vs. Drain Voltage
(Reference)**

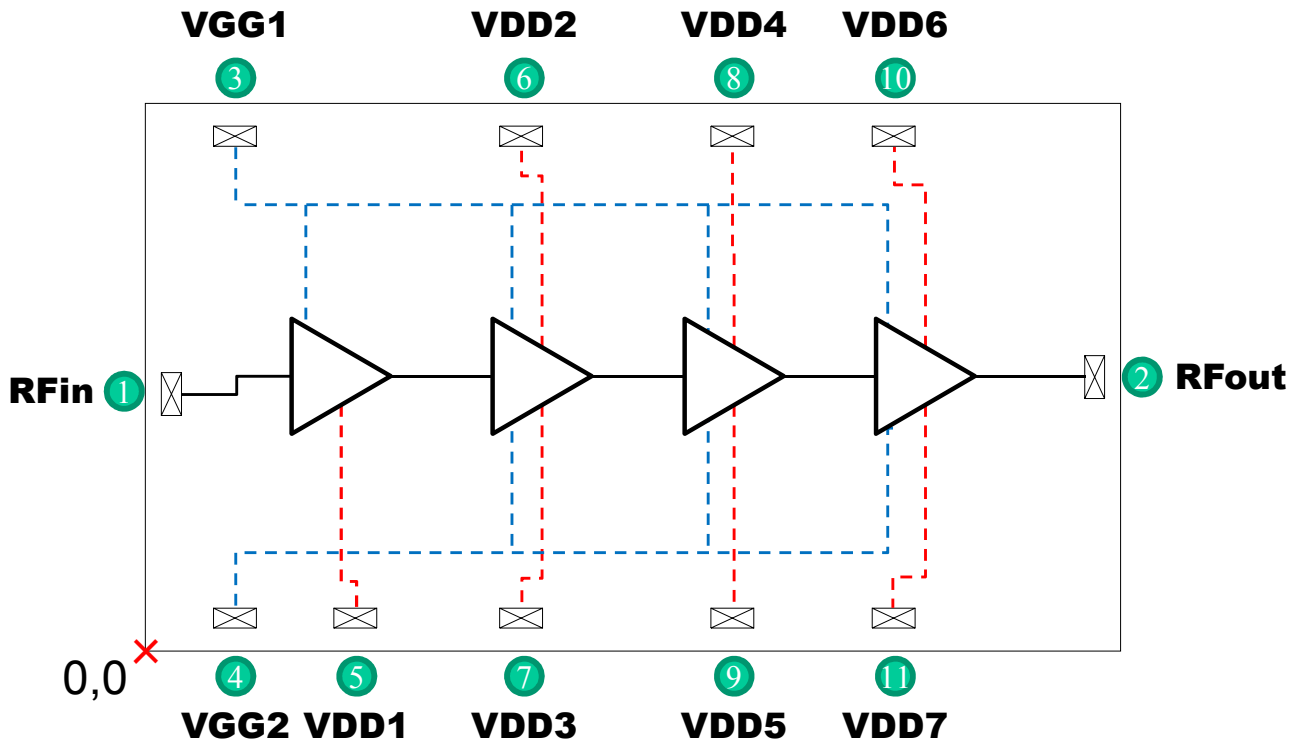
IDD=1100mA



Note: ΔT_{ch} : Temperature Rise from Backside of the Die to Channel.



■ Chip Outline and Bonding Pad Locations (Dimension in Micro-Meters)



Pad No.	Function	X	Y	Pad Size
1	RFin	90	896	80 x 160
2	RFout	3314	955	80 x 160
3	VGG1	313	1795	160 x 80
4	VGG2	313	115	160 x 80
5	VDD1	733	115	160 x 80
6	VDD2	1311	1795	160 x 80
7	VDD3	1311	115	160 x 80
8	VDD4	2049	1795	160 x 80
9	VDD5	2049	115	160 x 80
10	VDD6	2612	1795	160 x 80
11	VDD7	2612	115	160 x 80

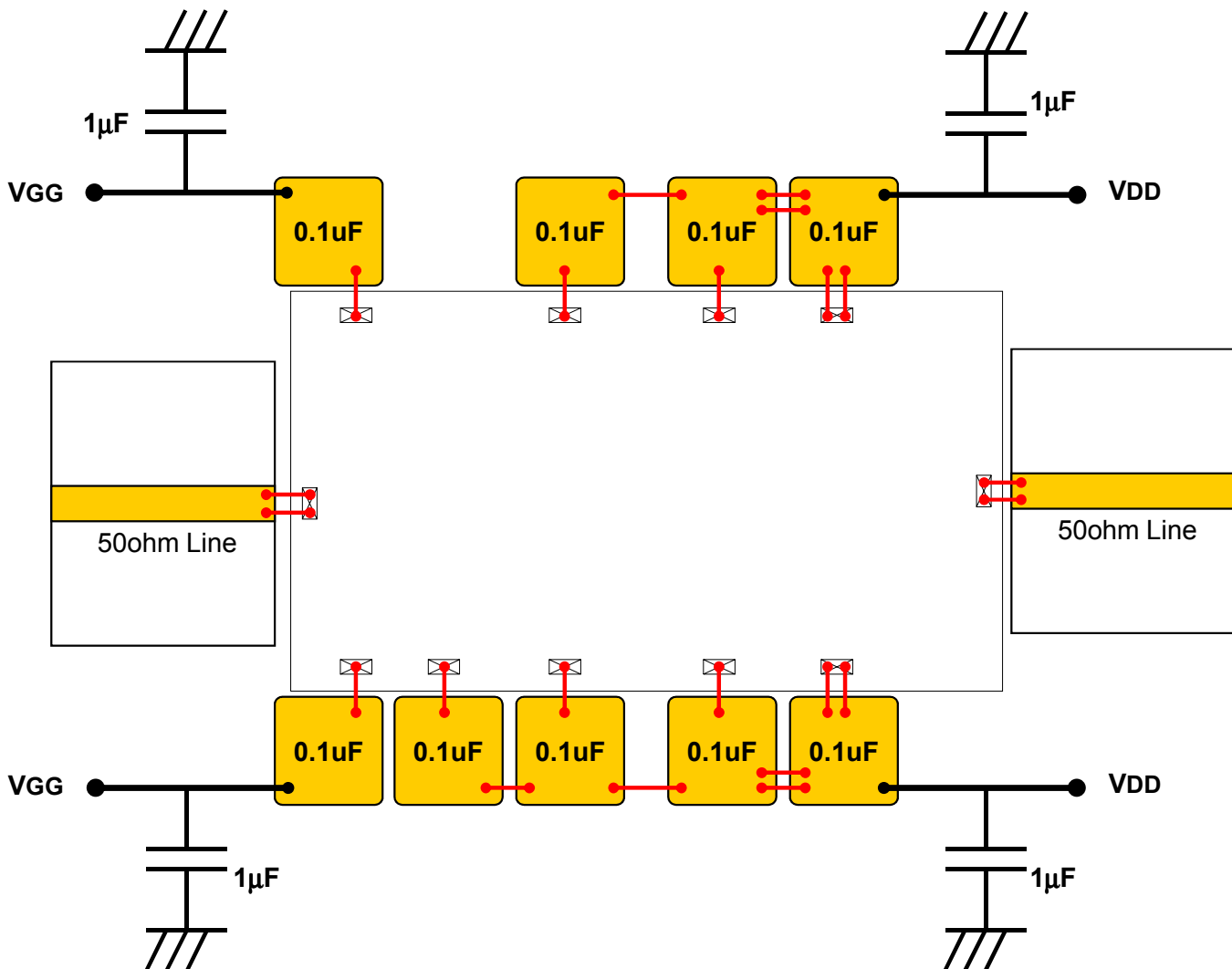
Chip Size : 3404 x 1910 um (+/- 30 um)

Chip Thickness : 60 um (+/- 20 um)

Note : All VDD and VGG1 pads must be biased. VGG2 is option.

■ Assembly Diagrams

Recommended Assembly



“Copper” is the recommended material for the package or carrier.

■ DIE ATTACH

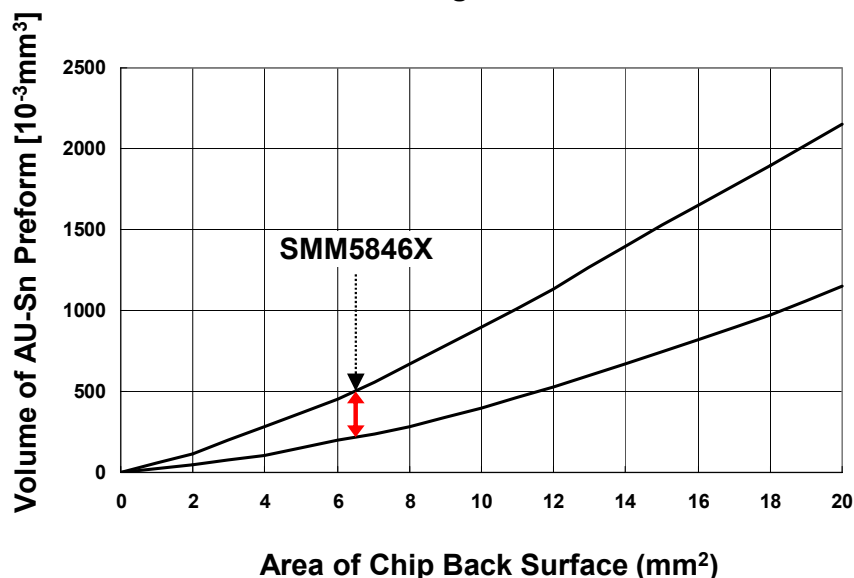
- 1) The die-attach station must have accurate temperature control and an inert forming gas should be used.
- 2) Chips should be kept at room temperature except during die-attach.
- 3) Place package or carrier on the heated stage.
- 4) Lightly grasp the chip edges by the longer side using tweezers.

Die attach conditions

Stage Temperature : 300 to 310 deg.C

Time : less than 15 seconds

AuSn Preform Volume : see below figure



■ WIRE BONDING

The bonding equipment must be properly grounded. The following or equivalent equipment, tools, materials, and conditions are recommended.

1) Bonding Equipment and Bonding Tool.

Bonding Equipment : West Bond Model 7400 (Manual Bonder)

Bonding Tool : CCOD-1/16-S-437-60-F-2010-MP (Deweyl)

2) Bonding Wire

Material : Hard or Half hard gold

Diameter : 0.7 to 1.0 mil

3) Bonding Conditions

Method : Thermal Compression Bonding with Ultrasonic Power

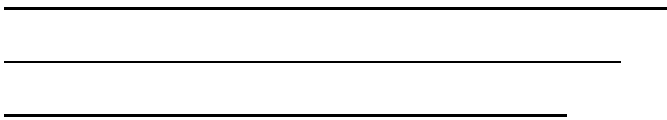
Tool Force : 0.196 N ± 0.0196 N

Stage Temperature : 215 deg.C ± 5 deg.C

Tool Heater : None

Ultrasonic Power Transmitter : West Bond Model 1400

Duration : 150 mS/Bond



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Ka-Band Power Amplifier MMIC

For further information please contact:

<http://global-sei.com/Electro-optic/about/office.html>

CAUTION

This product contains **gallium arsenide (GaAs)** which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- Do not put these products into the mouth.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.